

## Discussion

The USPTO rejected all claims of the application under 35 USC §103(a) as being unpatentable over Sarrazin, et al., U.S. Patent No. 5,356,851. The Applicants respectfully traverse this rejection.

### Analysis of Sarrazin, et al.

Sarrazin, et al. teach a catalyst for the selective hydrogenation of unsaturated hydrocarbons comprising a support, at least one Group VIII metal and at least one Group III A metal, chosen from gallium and indium. (Col. 1, lines 6 - 11 and Abstract.) The invention of Sarrazin, et al. is not the composition for a catalyst, but rather the order in which the components are added to form the catalyst. (See Col. 1, lines 29 - 37 and Claim 1.)

As stated by the Examiner (and Sarrazin, et al.), the molar ratio of the Group IIIA element (gallium or indium) to the Group VIII material is required to be between 0.3 and 2. In addition, in all Examples, the surface area of the support for the Sarrazin, et al. catalyst is 70 m<sup>2</sup>/g. Further, Sarrazin, et al. state that the preferred surface area of the support is from 10 to 500, most preferably 50 to 500. (Col. 3, lines 48 - 53.) Finally, the quantity of the gallium or indium present in the Sarrazin, et al. catalysts is required to be in the range from 0.01 to 10% and

preferably 0.1 to 5%. (See Col. 2, lines 25 - 30.) In the Examples, the quantity of palladium that is used is 0.3% and the quantity of gallium is from 0.07 to 1.22 wt %.

Once the USPTO establishes that a reference (or references) satisfy the *Graham* factual findings, the burden shifts to the Applicants to 1) show that the USPTO erred in those findings, or 2) provide other evidence of non-obviousness, such as unexpected results. The Applicants assert that they have satisfied their burden.

There are several significant distinctions not recognized by the USPTO between the invention, as claimed, and the catalysts that are disclosed in Sarrazin, et al. In addition, significant evidence exists in the application which proves non-obviousness, especially the unexpected results from the use of a significantly different composition for the claimed catalyst from the catalysts preferred by Sarrazin, et al.

1. The particular metals that are chosen in Sarrazin, et al. are required to be gallium and indium. In contrast, the metal required in each claim of the application is thallium. Note particularly that Sarrazin, et al. failed to even include thallium in their list of Group IIIA metals in either the specification or claims, only listing gallium and indium. While thallium is a Group IIIA metal, it is distinct from indium and gallium as it is significantly heavier with different properties. Notwithstanding,

the applicants do not rely on this distinction as the sole basis for distinguishing Sarrazin, et al. The Applicants merely point out that a person reviewing the disclosure of Sarrazin, et al. would be taught to only use gallium or indium as the required Group IIIA metal, not thallium, as chosen by Applicants.

Notwithstanding, the Applicants have amended claims to focus on additional, specific distinctions in the composition of their claimed catalysts. However, it is relevant to recognize that one of the two key elemental components of the catalyst, as claimed, thallium is different from one of the required elements of the catalyst of Sarrazin, et al. either gallium or indium. This factor is relevant when evaluating the remaining distinctions between the catalyst, as claimed, and the catalyst, as disclosed, in Sarrazin, et al.

2. The ratio of the palladium metal to the thallium metal, as now claimed in all product and process claims, is distinct from the preferred ratio disclosed in Sarrazin, et al. Sarrazin, et al., state that the preferred ratio of gallium and indium to the Group VIII element is between 0.3 and 2. In contrast, the Applicants' claims require a ratio between palladium and thallium of 5:1 to 50:1. (See independent Claims 1 and 13.) A significant distinction therefore exists from what is disclosed by Sarrazin, et al. In addition, the importance of this ratio to the Applicants' invention is supported in the Examples, where the performance of the

catalysts of Examples 5, 6 and 7, where the ratio of the palladium to the thallium is 10:1, is superior to the performance of the catalysts where the ratio was 1:1, as shown in Examples 3 and 4. A person skilled in the art would have been taught by Sarrazin, et al. to prepare catalysts for this process with a ratio between indium or gallium and the Group VIII metal of only 0.3 and 2. It is clear that the Applicants' preferred catalysts are produced only when the ratio is far outside of the ratio that is disclosed by Sarrazin, et al.

In para. 9, of the Office Action, the USPTO stated that the recitation of various ratios would be a normal undertaking of one of ordinary skill in the art at the time of the invention and would not require an inordinate degree of experimentation. However, Sarrazin, et al. specifically teach away from the optimal range that is now claimed by requiring that the ratio be between 0.3 and 2. In contrast, the claimed range in the application is from 5:1 to 50:1. This was an unexpected result, one that would not be anticipated by a person skilled in the art reviewing the disclosure of Sarrazin, et al. For this reason, the Applicants assert that the independent claims and all claims claiming from those claims are distinctive from Sarrazin, et al.

In addition, note the limitations of dependent Claims 12 and 17, wherein the ratio of the palladium metal to the thallium metal is required to be 10:1 to 20:1, ratios even further from any

disclosure of Sarrazin, et. al. These ranges were even more surprising based on the teaching of Sarrazin, et al. and thus are clearly patentable over Sarrazin, et al.

3. An additional significant distinction is taught by dependent Claim 9, wherein the quantity of thallium is required to be from 0.001 to 0.03 wt % of the catalyst. (In fact, as originally claimed in Claim 9, the range was from 0.001 to about 0.01 wt %.) In contrast, the smallest quantity of gallium in any example is 0.07 %. Further, at Col. 7, lines 1 - 3, Sarrazin, et al. teach "that it can be seen that the samples with a gallium content between 0.08 and 0.8 % by weight has a superior activity to that of the monometallic catalyst of example 1...." Note also that the best performance of any of the test samples of Sarrazin, et al. contained either 0.21 wt % or 0.22 wt %. (See Examples 2 and 6.) In contrast, the greatest amount of thallium present in any Example in the application was 0.03 wt % and the catalysts containing only 0.003 wt % actually performed best. Thus, a person skilled in the art reviewing Sarrazin, et al., particularly the Examples, would have been taught that the minimum quantity of gallium that should be present is 0.08%, a quantity that is almost three times the maximum amount that is claimed in Claim 9 and 8 times the maximum amount previously claimed in Claim 9 prior to being amended. That person skilled in the art would have also been taught that the preferred quantity taught by Sarrazin, et al. was about 0.21 wt %,

a quantity 7 times the maximum quantity claimed by Applicants in Claim 9.

In para. 9 of the Office Action, the USPTO again asserted that choosing weight percentages would merely be an optimization step that a person skilled in the art could easily determine. However, this is not true where the reference specifically teaches away from a particular range, especially when the range specifically disclosed by Sarrazin, et al. is almost 3 times the quantity of the material that is required in the claims of the application. The result discovered by the Applicants was clearly unexpected. Under the rules published by the USPTO on October 10, 2007 for determining obviousness, evidence of "unexpected results" is a significant factor to be considered by the USPTO in overcoming a finding of obviousness. Accordingly, dependent Claim 9 is distinctive from the teaching of Sarrazin, et al.

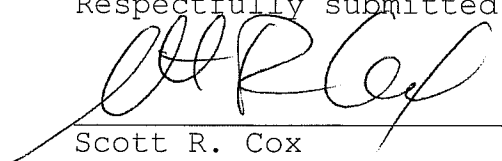
4. The surface area of the support material is required to have a range of 1 to about 10 m<sup>2</sup>/g in dependent Claim 5. This range is significantly less than the range for the support that is taught in Sarrazin, et al. In all of the Examples the surface area was 70 m<sup>2</sup>/g. The preferred surface area for the support of Sarrazin, et al. was in the range of 50 to 500 m<sup>2</sup>/g. In contrast, the Applicants have discovered that an extremely low surface area support provides improved performance for their catalyst. Compare the performance of Example 3 and Example 4, where one has a surface area of 50 m<sup>2</sup>/g

and the other has a surface area of 5 m<sup>2</sup>/g. Thus, the Applicants surprisingly discovered that the surface area of the support was an important criteria to be considered. Once again, this was an "unexpected" result and one that significantly distinguishes Applicants' invention from the invention, as disclosed, in Sarrazin, et al. and overcomes the initial determination of obviousness by the USPTO against Claim 5.

**CONCLUSION**

For all of these reasons the Applicants believe that all claims of the application are in a condition for allowance and request the issuance of a Notice of Allowance. If there are any questions, please contact Applicants' counsel.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "SR Cox", is written over a horizontal line.

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